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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/744,113	03/19/2001	Gabriele Nelles	450117-03033	2990
20999	7590	07/02/2004	EXAMINER	
FROMMER LAWRENCE & HAUG 745 FIFTH AVENUE- 10TH FL. NEW YORK, NY 10151			HON, SOW FUN	
			ART UNIT	PAPER NUMBER
			1772	
DATE MAILED: 07/02/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/744,113

Applicant(s)

NELLES ET AL.

Examiner

Sow-Fun Hon

Art Unit

1772

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 74-97 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 74-79,81-91 and 93-96 is/are rejected.
- 7) ☒ Claim(s) 80,92 and 95 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/21/04 has been entered.

### ***Response to Amendment***

#### ***Withdrawn Rejections***

2. The 35 U.S.C. 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraph rejections have been withdrawn due to Applicant's amendment dated 04/21/04.
3. The 35 U.S.C. 103(a) rejections have been withdrawn due to Applicant's amendment dated 04/21/04.

### ***New Rejections***

#### ***Claim Rejections - 35 USC § 103***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
5. Claims 74-79, 81-89, 93-94, 96-97 are rejected under 35 U.S.C. 103(a) as being unpatentable over Georger, Jr. et al. (previously cited US 5,510,628) in view of Kawata (previously cited US 6,061,113).

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Georger, Jr. et al. is directed to a basic substrate which contains a patterned surface (column 9, lines 20-35) for the selective neurite outgrowth (of cells in the definition of neuron geometry formation) (column 9, lines 35-40). Prior art is cited in which a large neuron is positioned over and adhered to substrate mounted electrodes (column 10, lines 40-42). The microsensor has a transducer which stimulates the cell adhering to it (column 10, lines 45-50). Georger, Jr. et al. teaches an embodiment wherein a liquid crystal or conductive polymer acts as the transducer for the microsensor, and has a surface area coated with cell adhesion promoter which permits adhesion of a cell on the transducer. The transducer is used to stimulate the cell (column 10, lines 45-55). The basic structure comprises a glass substrate (column 12, lines 60-65).

Georger, Jr. et al. teaches the alignment (placement) of cells within lithographically defined physical barriers such as microtrenches or wells, and onto substrate-embedded microelectrodes (column 15, lines 55-70). Thus although Georger, Jr. et al. fails to specifically teach that the liquid crystal acting as the transducer is aligned by an alignment layer on the basic substrate, one of ordinary skill in the art would have known that the microtrenches provide alignment of the liquid crystal transducer which provides the electrical stimulation for neuron cell growth.

Georger Jr. et al. teaches polyester (polyethylene terephthalate), polyamide, polyurethane, polymethacrylate, azosilane (silazane) as the patterned film (column 5, lines 35-45), and since the polymeric layer alignment of liquid crystal is well known in the art, it would have been obvious to one of ordinary skill in the art to have used those materials as alignment layers for the liquid crystal transducer.

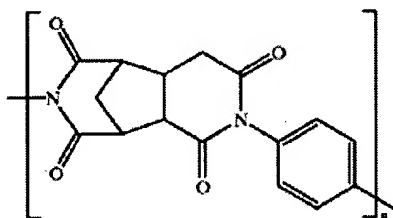
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Georger, Jr. et al. fails to teach a combined alignment layer as defined by Applicant (specification, pages 7-11).

Kawata has a glass support (column 5, lines 55-60) with an alignment layer formed with a chromophore (photochromic compound) which includes azobenzene (column 6, lines 6-16) of thickness 100 nm to 5000 nm (0.1-5  $\mu\text{m}$ ) (column 7, lines 60-65). The chromophore is reacted (chemically bound) to a polymer which is a polyvinyl alcohol (column 7, lines 20-30).

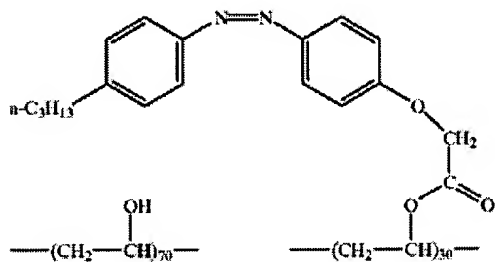
A polyimide with a homolog variation of the claimed structure (a phenyl instead of a biphenyl on one side) (column 15, lines 5-20) is shown below:

(Polyimide)



A polyvinyl alcohol is reacted with the azobenzene chromophore (column 16, lines 25-35) is shown below wherein the vinyl alcohol repeat unit is an insert on the bottom left :

(Photo isomerization polymer)



The azobenzene attached to the polyvinyl alcohol via the ester linkage yields an azobenzene sidechain liquid crystalline polyester as defined by Applicant (specification, page 8). The longer alkyl chain on the very tip of the azobenzene is a homolog of the shorter alkyl chain.

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P6a12, P68a10, P10a10, P8a12 and P10a12, defined by Applicant (specification, page 18) are homologs where the x-para-substituent varies in terms of the number of methylene groups, n varies in terms of the number of methylene groups in the flexible side chain spacer and m varies in the number of methylene groups in the acidic part of the main chain.

Kawata teaches that the alignment defect for an alignment layer formed with the azobenzene chromophore (column 17, lines 1-15) is lower than one formed without (column 17, lines 15-25).

Therefore it would have been obvious to one of ordinary skill in the art to have used the azobenzene sidechain liquid crystalline polyester taught by Kawata, as the alignment surface with microtrenches to align the liquid crystal transducer in Georger, Jr. et al., in order to obtain a substrate structure for neurite outgrowth with higher alignment precision due to lower alignment defect.

6. Claims 90-91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Georger, Jr. et al. in view of Kawata as applied to claims 74-79, 81-89, 93-94, 96-97 above, and further in view of Grainger et al. (previously cited US 5,686,549).

Georger Jr. et al. has been discussed above and teaches the substrate structure for neurite outgrowth, with at least one neuron on top of said basic structure and the liquid crystal.

Kawata demonstrates that liquid crystal aligned by an alignment layer is well known in the art, and teaches an azobenzene chromophore added onto the side chain of the polymer comprising the alignment layer. Kawata fails to teach that polypeptides are equivalent to the polyimide and polyvinyl alcohol materials used as the alignment polymer.

Grainger et al. teaches the formation of an anisotropic polymeric film on a substrate to impart anisotropic properties to the substrate (column 1, lines 50-55). The polymers recited are polyimide, polyamide, polyacrylate and polymethacrylate (column 2, lines 55-65) and polyvinyl alcohol (column 12, lines 50-65). The polymer also comprises polypeptide, a liquid crystal molecule, a polar adhesive group and a chromophore (column 5, lines 1-10), wherein poly(benzyl)glutamate is an example of a polypeptide (column 11, lines 40-50). Grainger et al. teaches that the polymer is bound across the surface of a substrate in a predetermined alignment (pattern) as points of attachment for cell growth (column 15, lines 10-20) thus enabling its use as an alignment layer on the substrate for cell growth in Georger, Jr. et al.

Therefore it would have been obvious to one of ordinary skill in the art to have used the polypeptide materials of Grainger et al., as the alignment surface with microtrenches to align the liquid crystal transducer in Georger, Jr. et al., in order to obtain an alternate basic substrate for neurite outgrowth.

### ***Response to Arguments***

7. Applicant argues that nowhere does Georger teach liquid crystalline material as a separate layer or in a combined alignment layer.

Applicant is respectfully apprised that liquid crystal is indeed taught as a transducer on which a single (neuron) cell is located ('628, column 10, lines 40-65).

8. Applicant argues that the use of liquid crystalline material allows for a reversible switching, whereby the structure on the surface of the substrate can be altered for controlling and orienting the neurite outgrowth.

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Applicant is respectfully apprised that the features upon which applicant relies (i.e., reversible switching along with the means for doing so (e.g. specification, pages 13-14) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

9. Applicant argues that Kawata only teaches a liquid crystal display, and fails to teach orienting of neurite outgrowth.

Applicant is respectfully reminded that Kawata teaches that the alignment defect for an alignment layer formed with the azobenzene chromophore is lower than one formed without ('113, column 17, lines 1-15). Both Kawata and Georger are directed to a film for alignment on a substrate, and are thus analogous art. Therefore it would have been obvious to one of ordinary skill in the art to have used the azobenzene sidechain liquid crystalline polyester taught by Kawata as the alignment surface with microtrenches in the invention of Georger in order to obtain a substrate structure for neurite outgrowth with higher alignment precision due to lower alignment defect.

10. Applicant argues that Grainger only mentions antibodies that are attached to the polymeric article and can thus be used in analytical techniques, such as immunoassays, which is not cell growth.

Applicant is respectfully apprised that Grainger does teach that the polymer is bound across the surface of a substrate in a predetermined alignment (pattern) as points of attachment for cell growth ('549, column 15, lines 10-20) thus enabling it to be used as an alignment layer on the substrate for cell growth in Georger.

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11. Applicant argues that neurite outgrowth is different from cell growth in that neurite outgrowth is the formation and extension of a neuron by way of neurites, the term neurite relating to the combination of axon and dendrites.

Applicant is respectfully apprised that the primary reference Georger does teach neurite outgrowth as discussed above. Grainger is the secondary reference which teaches that the polymer is bound across the surface of a substrate in a predetermined alignment (pattern) as points of attachment for cell growth ('549, column 15, lines 10-20), thus enabling it to be used as an alignment layer on the substrate for cell growth in Georger. The conditions for cell growth are necessary for neurite outgrowth. Hence there is motivation to combine and expectation of success present in the prior art.

***Allowable Subject Matter***

12. Claims 80, 92, 95 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached on (571)272-1498. The fax phone number for the organization where this application or proceeding is assigned is (703)872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Sow-Fun Hon

06/18/04

  
HAROLD PYON  
SUPERVISORY PATENT EXAMINER  
1772

6/28/04